

## LESSON LEARNING GOALS

Identify the curriculum expectations (MOE, 2005) grade-before and grade-after the grade specific learning goal:

- to see the development of mathematical knowledge, skills, and strategies across grade levels
- to determine the mathematical focus of the problems chosen for Before (activation), During (lesson), and After (Practice) parts of the lesson

### BEFORE (Getting Started)

- 5 to 10 minutes
- Activating students' mathematical knowledge and experience using a prompt or problem that is directly relates to the mathematics in the lesson problem.
- Includes student responses to prompt/problem to highlight key ideas/strategies.

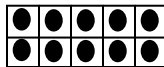
### "12" Problem:

What does 12 look like? Explain your thinking.

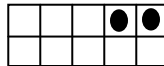
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||||| ||||| || counting tally

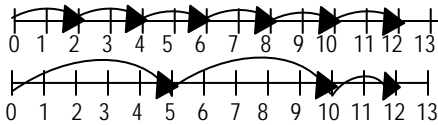
$$\begin{aligned} 1+1+1+1+1+1+1+1+1+1 &= 12 \\ 2+2+2+2+2+2 &= 12 \\ 5+5+2 &= 12 \end{aligned}$$



ten frames



addition equations



$2+2+2+2+2=12$   
number line  
 $5+5+2=12$

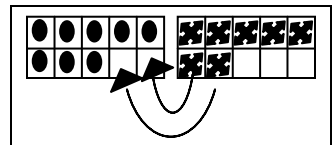
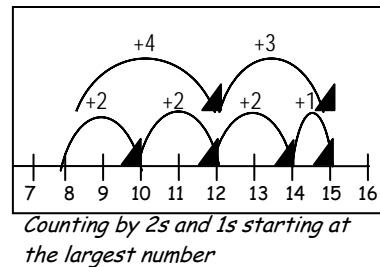
### AFTER (Consolidation)

- 20 to 25 minutes
- Teacher selects 2 or more solutions for class analysis and discussion in a sequence (1<sup>st</sup>, 2<sup>nd</sup>, 3<sup>rd</sup>, etc.) based on mathematical relationships between the solutions and the lesson learning goal.
- Students (authors) explain and discuss their solutions with their classmates.
- During whole class discussion, solutions are organized (often re-organized) to show mathematical elaboration from one solution to the next and towards lesson learning goal.
- Teacher mathematically annotates (math terms, math symbols, labelled diagrams, concise explanations) on and around solutions to make mathematical ideas, strategies, and models of representation explicit to students.

How many equal groups?

equivalent number expressions

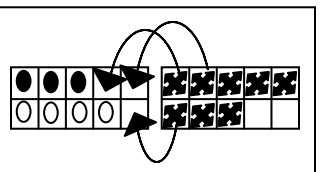
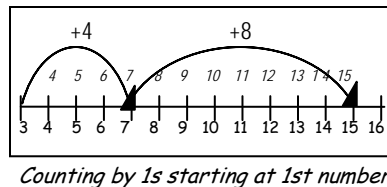
$$\begin{aligned} 8+3+4 &= 8+5+2 \\ 8+2+5 &= 10+5 \\ 15 &= 15 \end{aligned}$$



$$8+3+4 = 8+2+5$$

equivalent number expressions

$$\begin{aligned} 3+4+8 &= 3+2+4+1+5 \\ 5+5+5 &= 15 \\ 15 &= 15 \end{aligned}$$



$$3+4+8 = 3+2+4+1+5$$

### DURING (Working on It)

- 15 to 20 minutes
- Understanding the problem – Teacher asks, "What information from the problem are we using to make a plan to solve it? Explain." Teacher records in a list below the problem, the information that students identify.
- Students solve the problem on chart paper (landscape) with markers (visible for whole class discussion) in pairs or in small groups.
- Teacher circulates to record different student solutions, in addition to the ones the teacher anticipated.

### Butterfly Problem A:

Three butterflies landed on a bush. Then, 4 more butterflies landed. Later, 8 more butterflies joined them on the bush.

How many butterflies are on the bush altogether?

Show your work.

What information will we use to solve this problem?

- 3 butterflies
- 4 more butterflies
- 8 more butterflies
- How many total butterflies?
- Show your work - calculations, labelled diagrams

Counting On

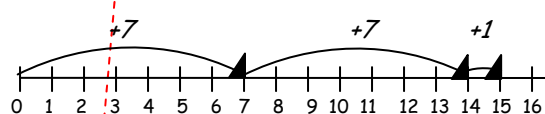
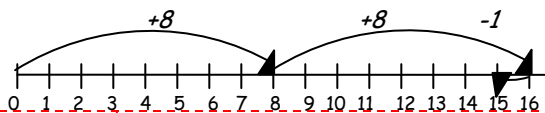
Making 5s and 10s

Counting Addition by

Note: Mathematical annotations include mathematical vocabulary, symbols, elaborations of mathematical details from solutions, labels describing the method/strategy, and questions to further thinking. All annotations are records of students' mathematical discussion.

Grade 1	Grade 2	Grade 3
- solve a variety of problems involving the addition and subtraction for whole numbers to 20 using concrete materials and drawings; solve problems involving the addition and subtraction of single-digit whole numbers, using a variety of mental strategies	- solve problems involving the addition and subtraction of whole numbers to 18 using a variety of mental strategies - represent and explain, through investigation using concrete materials and drawings, multiplication as the combining of equal groups	- relate multiplication for one-digit numbers ... to real life situations, using a variety of strategies - multiply to $7 \times 7$ ... using a variety of mental strategies

### number line models



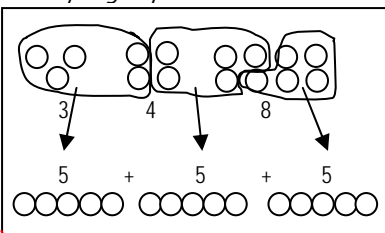
### equivalent number expressions

$$\begin{aligned}
 3 + 4 + 8 &= 5 + 5 + 5 \\
 7 + 8 &= 10 + 5 \\
 5 + 2 + 8 &= 10 + 5 \\
 5 + 10 &= 10 + 5 \\
 15 &= 15
 \end{aligned}$$

### commutative property

- addition  
 $5 + 10 = 10 + 5$   
 - multiplication  
 $5 \times 3 = 3 \times 5$

3 equal groups of 5  $\rightarrow 5 \times 3 = 15$



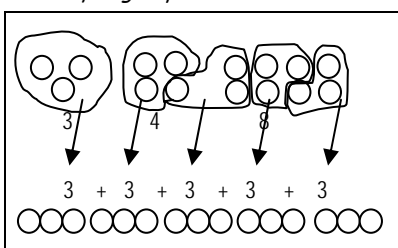
7 is close to half of 15 and 1 less

$$\begin{aligned}
 7 + 7 + 1 &= 14 + 1 \\
 15 &= 15
 \end{aligned}$$

### equivalent number expressions

$$\begin{aligned}
 3 + 4 + 8 &= 3 + 3 + 3 + 3 + 3 \\
 3 + 12 &= 12 + 3 \\
 15 &= 15
 \end{aligned}$$

5 equal groups of 3  $\rightarrow 3 \times 5 = 15$



8 is close to half of 15 and 1 more

$$\begin{aligned}
 8 + 8 - 1 &= 16 - 1 \\
 15 &= 15
 \end{aligned}$$

half of doubles

Doubles 1 More or Less

Equal Size Groups

Regrouping

### AFTER (Highlights/Summary)

- 5 minutes
- Teacher and students revisit the student solutions for key ideas, strategies, and models of representation that are related to the lesson learning goal.
- Teacher lists key ideas, strategies, and models of representation separately, so the students can see how the mathematical details from their solutions relate explicitly to the lesson learning goal.

### Highlights/Summary:

#### Addition Strategies -

- counting (by 1s, counting on from the first number, counting on from the larger number),
- joining or combining quantities (addition) by regrouping to make 5s and 10s,
- regrouping to make equal groups

#### Multiplication as equal size groups

$$\begin{aligned}
 (5+5+5) &\rightarrow 5 \times 3 = 15 & (3+3+3+3+3) &\rightarrow 3 \times 5 = 15 \\
 \text{size of group} & & \text{number of groups} & \\
 \text{(multiplicand)} & & \text{(multiplier)} & \\
 & & \text{(product)} &
 \end{aligned}$$

#### Equivalent Number Expressions

$$5+5+5 = 5 \times 3 \quad 15 = 5+5+5 \quad 5 \times 3 = 15$$

### AFTER (Practice)

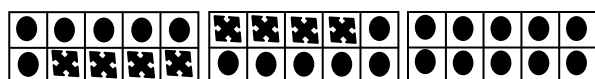
- 5 to 10 minutes
- Teacher chooses 2 or 3 problems, similar to the lesson problem for student to solve in pairs as a scaffold and individually.
- Problems could vary by number (choice, size), problem contexts, or what is unknown or needs to be solved
- Students are asked to solve these problems using a strategy different from the one they used for the lesson problem.

### Butterfly Problem B:

Six butterflies landed on a bush. Then, 8 more butterflies landed. Later, 16 more butterflies joined them on the bush.

How many butterflies are on the bush altogether?

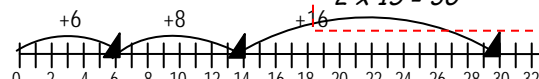
#### Solution 1



$$\begin{aligned}
 6+8+16 &= 10+10+10 \\
 10+10+10 &= 30 \\
 30 &= 6+8+16
 \end{aligned}$$

regrouping to make tens  
 $10+10+10 = 10 \times 3$

#### Solution 2



counting by 2s

$$2 \times 15 = 30$$

Note: A classroom board is longer proportionally than these 2 pages. Due to the space constraints on these pages, the mathematical annotations are recorded above the solutions with arrows, rather than on and around the solutions.